BBMP

BRUHAT BENGALURU MAHANAGARA PALIKE

R.R NAGARA DIVISION

NAME OF WORK: IMPROVEMENTS OF SIDDHARTHA NAGARA SLUM IN WARD NO-16 IN RR NAGAR CONSTITUENCY

ESTIMATE COST: 400.00 LAKHS

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APPENDIX

BIS = Bureau of Indian Standards

BC = Bituminous Concrete

BBD = Benkelman Beam Deflection

BBMP = Bruhat Bengaluru Mahanagara Palike

BWSSB = Bengaluru Water & Sewerage Supply Board

BOQ = Bill of Quantities

CBR = California Bearing Ratio

CH = Chainage

DBM = Dense Bituminous Macadam

DTM = Digital Terrain Model

GSB = Granular Sub Base

HIP = Horizontal Intersection Points

IRC = Indian Road Congress

KM = Kilometre

MSA = Multi Scale Axle

MORT & H = Ministry Of Road Transport & Highway

O/H = Over Head

OFC = Optical Fibre Cables

PCU = Passenger Car Unit

PWD = Public Work Department

PI = Plasticity Index

PMC = Project Management Consultant

RCC = Reinforced Cement Concrete

ROW = Right of Way

TBM = Temporary Bench Marks

WMM = Wet Mix Macadam

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Chapter-1

INTRODUCTION

1.1 GENERAL

Bangalore is the capital of Karnataka. It is located on the Deccan Plateau in the south-eastern part of Karnataka. Bangalore is India's third most populous city and fifth-most populous urban agglomeration. Bangalore is well known as a hub for India's Information Technology sector. It is among the top 10 preferred entrepreneurial locations in the world Bangalore is sometimes referred to as the "Silicon Valley of India" (or "IT capital of India") because of its role as the nation's leading information technology (IT) exporter. Indian technological organizations ISRO, Infosys, Wipro and HAL are headquartered in the city. A demographically diverse city, Bangalore is the second fastest-growing major metropolis in India.

1.2 GEOGRAPHY

Bangalore lies in the southeast of the South Indian state of Karnataka. It is in the heart of the Mysore Plateau (a region of the larger Precambrian Deccan) at an average elevation of 900 m (2,953 Ft.).It is located at 12.97°N 77.56°E and covers an area of 741 km2 (286 sq mi).The majority of the city of Bangalore lies in the Bangalore Urban district of Karnataka and the surrounding rural areas are a part of the Bangalore Rural district. The topology of Bangalore is flat except for a central ridge running NNE-SSW. The highest point is Vidyaranyapura Doddabettahalli, which is 962 m (3,156 ft) and lies on this ridge. No major rivers run through the city, though the Arkavathi and South Pennar cross paths at the Nandi Hills, 60 km (37 mi.) to the north. River Vrishabhavathi, a minor tributary of the Arkavathi, arises within the city at Basavanagudi and flows through the city. The rivers Arkavathi and Vrishabhavathi together carry much of Bangalore's sewage. A sewerage system, constructed in 1922, covers 215 km^2 (133 mi^2) of the city and connects with five sewage treatment centers located in the periphery of Bangalore

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1.3 CLIMATE

Bangalore has a tropical savanna climate (Koppen climate classification Aw) with distinct wet and dry seasons. Due to its high elevation, Bangalore usually enjoys a more moderate climate throughout the year, although occasional heat waves can make summer somewhat uncomfortable the coolest month is January with an average low temperature of 15.1 °C (59.2 °F) and the hottest month is April with an average high temperature of 35 °C (95 °F).. The highest temperature ever recorded in Bangalore is 39.2 °C (103 °F) (recorded on 24 April 2016) as there was a strong El Nino in 2016 There were also unofficial records of 41 °C (106 °F) on that day. The lowest ever recorded is 7.8 °C (46 °F) in January 1884 Winter temperatures rarely drop below 14 °C (57 °F), and summer temperatures seldom exceed 36 °C (97 °F). Bangalore receives rainfall from both the northeast and the southwest monsoons and the wettest months are September, October and August, in that order. The summer heat is moderated by fairly frequent thunderstorms, which occasionally cause power outages and local flooding. Most of the rainfall occurs during late afternoon/evening or night and rain before noon is infrequent. November 2015 (290.4 mm) was recorded as one of the wettest months in Bangalore with heavy rains causing severe flooding in some areas, and closure of a number of organizations for over a couple of days The heaviest rainfall recorded in a 24-hour period is 179 millimeters recorded on 1 October 1997

1.4 CIVIC ADMINISTRATION

The **Bruhat Bengaluru Mahanagara Palike (BBMP)**, is the administrative body responsible for civic amenities and some infrastructural assets of the Greater Bangalore metropolitan area.[1] It is the fourth largest Municipal Corporation in India being responsible for a population of 6.8 million in an area of 741 km^2. Its boundaries have expanded more than 10 times over the last six decades. Its roles and responsibilities include the "orderly development of the city" — zoning and building regulations, health, hygiene, licensing, trade and education, as well as quality of life issues such as public open space, water bodies, parks and greenery. The BBMP represents the third level of government (the Central Government and State Government being the first two levels). BBMP is run by a city council composed of elected representatives, called "corporators", one from each of the wards (localities) of the city

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BRUHAT BENGALURU MAHANAGARA PALIKE

The Bruhat Bengaluru Mahanagara Palike (BBMP) is the administrative body responsible for the civil and infrastructural assets of the Greater Bangalore metropolitan area.

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1.4.1 HISTORY

The history of municipal governance of Bangalore dates back to 27 March 1862, when nine leading citizens of the old city formed a Municipal Board under the Improvement of Towns Act of 1850 with a similar Municipal Board was also formed in the newer Cantonment area.[3] The two boards were legalised in 1881, and functioned as two independent bodies called the Bangalore City Municipality and the Bangalore Civil and Military Station Municipality (Cantonment). The following year, half of the municipal councillors were permitted to be elected; property tax was introduced and greater powers given over police and local improvement.

After Indian independence, the two Municipal Boards were merged to form the Corporation of the City of Bangalore in 1949, under the Bangalore City Corporation Act. The corporation then consisted of 70 elected representatives and 50 electoral divisions and the office of Mayor introduced for the first time. The first elections were held in 1950.

The name of the council changed — first to Bangalore City Corporation (BCC) and then to Bangalore Mahanagara Palike

In 1991 the BMP expanded to include 87 wards in 1991 and 100 wards in 1995. The council also included 40 additional members drawn from the parliament and state legislature.

In November 2006, the BMP Council was dissolved by the state government upon the completion of its five year term. In January 2007, the Karnataka Government issued a notification to merge 100 wards of the erstwhile Bangalore Mahanagara Palike with seven City Municipal Councils (CMC)s, one Town Municipal Council (TMC) and 111 villages around the city to form a single administrative area.[4] The process was completed by April 2007 and the body was renamed 'Bruhat Bangalore Mahanagara Palike'(Greater Bangalore Municipal Corporation).

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1.4.2 STRUCTURE

A mayor and deputy mayor of the council are also elected for a period of 1-year, though not by popular votethe BBMP is at present run by an Administrator and a Commissioner, who are appointed by the State Government. The Additional Commissioner is a specially appointed IRS officer. The Bruhat Bangalore Mahanagara Palike is responsible for civic and infrastructural requirements of the city. It often works in conjunction with other civic bodies such as the Agenda for Bangalore Infrastructure Development Task Force (ABIDe) and the Bangalore Development Authority (BDA) to design and implement civic and infrastructural projects

The 12th Schedule of the Constitution of India (Article 243 W), inserted by the constitution 74th Amendment Act of 1992, provides a list of 18 functions as belonging to the legitimate domain of Urban Local Bodies .

1. Urban Planning including town planning
2. Regulation of land use and construction of buildings
3. Planning for economic and social development
4. Roads and bridges
5. Water Supply for domestic, industrial and commercial purposes
6. Public health, sanitation, conservancy and Solid Waste Management
7. Fire services
8. Urban forestry, protection of the environment and promotion of ecological aspects
9. Safeguarding the interests of weaker sections of society, including the handicapped and the mentally retarded
10. Slum improvement and upgradation
11. Urban Poverty Alleviation
12. Provision of urban amenities and facilities such as parks, gardens and play grounds
13. Promotion of cultural, educational and aesthetic aspects
14. Burials and burial grounds, cremations, cremation Ghats/grounds, and electric crematoria
15. Cattle pounds, prevention of cruelty to animals
16. Vital statistics including registration of birth and deaths
17. Public amenities including street lighting, parking lots, bus stops and public conveniences
18. Regulation of slaughter houses and tannerie

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1.4.3 ZONES

BBMP is divided into ten zones, for the ease of administration each administered by a Zonal Commissioner:

1. Yelahanka Zone
2. Dasarahalli Zone
3. Govindarajanagara Zone
4. Padmanabhanagar Zone
5. Jayanagara Zone
6. Bommanahalli Zone
7. Mahadevapura Zone
8. Krishnarajapuram Zone
9. Malleswaram Zone
10. Rajajinagar Zone

Every zone has a Joint Commissioner, who is answerable to the BBMP commissioner. The decentralization hasn't been very effective in addressing the problems in administration. The end of 2013 saw discussions in various circles about dividing BBMP into more parts.

1.4.4 ROLES AND RESPONSIBILITIES

The Bruhat Bangalore Mahanagara Palike is the fourth largest Municipal Corporation in India, after the city corporations that administer Mumbai, Delhi and Chennai. The BBMP is responsible for infrastructural assets of the Greater Bangalore Metropolitan area, spread across 741 km^2, with a population of 6.8 million.

Its roles and responsibilities include the "orderly development of the city "zoning and building regulations, health, hygiene, licensing, trade and education, as well as quality of life issues such as lung spaces, water bodies, parks and greenery.

As part of this, Bruhat Bengaluru Mahanagara Palike (BBMP) is desirous of obtaining consultancy services for the preparation of Design Report for roads. BBMP has taken up substantial projects covering the limits specified involving roads, footpaths, drainage works etc.

M/S Civil Quality Consultants & Engineers has been appointed as a consultant to perform the services. This Report deals with the approach, methodology, investigation details of project roads and the role of Consultants.

SCOPE OF WORK

The Scope of Services of the Consultancy includes the following:

Inventory and condition surveys for existing road & pavement, cross drainage

Structures and bridges

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CALIFORNIA BEARING RATIO

California Bearing Ratio (CBR) test is a penetration test meant for the evaluation of sub grade strength of roads and pavements. The results obtained by these tests are used with the empirical curves to determine the thickness of pavement and its component layers. This is the most widely used method for the design of flexible pavement

APPARATUS FOR CBR TEST

Loading machine-any compression machine can operate at constant rate of 1.25mm per minute can be used. Cylindrical moulds- moulds of 150mm diameter and 175mm height provided with a collar of about 50mm length and detachable perforated base.

Compaction rammer, surcharge weight-annular weights each of 2.5kg and 147mm diameter. IS sieve 20mm, coarse filter paper, balance etc.

PROCEDURE OF CALIFORNIA BEARING RATIO TEST

- Sieve the sample through 20mm IS sieve. Take 5 kg of the sample of soil specimen. Add water to the soil in the quantity such that optimum moisture content or field moisture content is reached.
- Then soil and water are mixed thoroughly. Spacer disc is placed over the base plate at the bottom of mould and a coarse filter paper is placed over the spacer disc.
- The prepared soil water mix is divided into five. The mould is cleaned and oil is applied. Then fill one fifth of the mould with the prepared soil. That layer is compacted by giving 56 evenly distributed blows using a hammer of weight 4.89kg.
- The top layer of the compacted soil is scratched. Again second layer is filled and process is repeated. After 3rd layer, collar is also attached to the mould and process is continued.
- After fifth layer collar is removed and excess soil is struck off. Remove base plate and invert the mould. Then it is clamped to base plate.
- Surcharge weights of 2.5kg are placed on top surface of soil. Mould containing specimen is placed in position on the testing machine.
- The penetration plunger is brought in contact with the soil and a load of 4kg(seating load) is applied so that contact between soil and plunger is established. Then dial readings are adjusted to zero.
- Load is applied such that penetration rate is 1.25mm per minute. Load at penetration of 0.5, 1, 1.5, 2, 2.5, 3, 4, 5, 7.5, 10 and 12.5mm are noted.

C.B.R. = Test load/Standard load * 100

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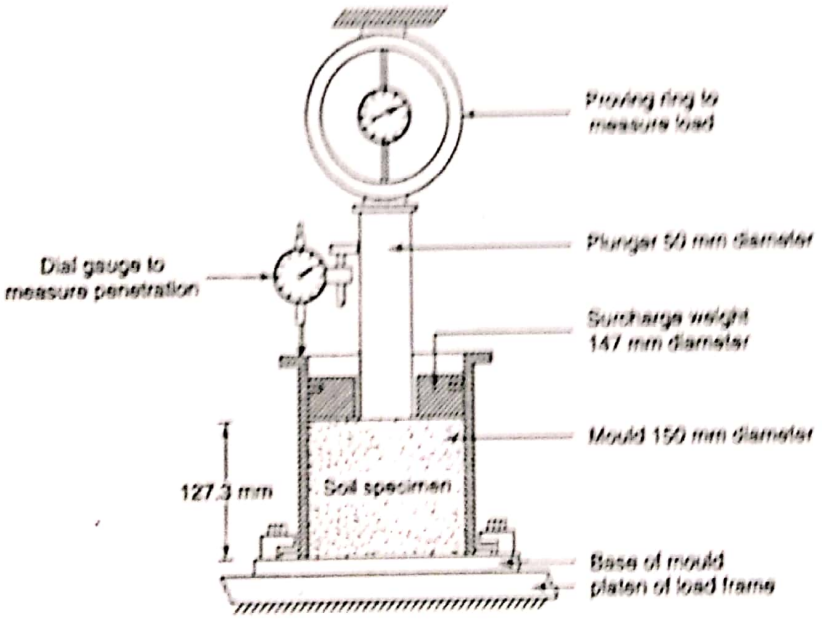
STANDARD LOAD VALUES FOR CBR TEST

Penetration(mm)	Standard Load(kg)	Unit Standard Load(kg/cm2)
2.5	1370	70
5	2055	105
7.5	2630	134
10.0	3180	162
12.5	3600	183

The harder the material, the higher the CBR value. A CBR value of 2% is usually found for clay, high-quality sub-base will have CBR values between 80% and 100%, and some sands may have values around 10%. The CBR testing can be applied to soils with a maximum particle size of 20 mm


Proving ring to measure load
Plunger 50 mm diameter
Dial gauge to measure penetration
Surcharge weight 147 mm diameter
Mould 150 mm diameter
127.3 mm
Soil specimen
Base of mould platen of load frame

Schematic representation of CBR test

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BENKELMAN BEAM DEFLECTION TECHNIQUE

GENERAL:

A.C. Benkelman devised the simple deflection beam in 1953 for measurement of pavement surface deflection on the WASHO Test Road. It is widely used all over the World for evaluation of the requirements of strengthening of flexible pavements

Benkelman Beam Deflection Technique is the process of evaluating the strengthening requirement of existing flexible road pavements

BASIC PRINCIPLES OF DEFLECTION METHOD

Performance of flexible pavements is closely related to the elastic deflection of pavement under the wheel loads. The deformation or elastic deflection under a given load depends upon subgrade soil type, its moisture content and compaction, the thickness and quality of the pavement courses, drainage conditions, pavement surface temperature etc. Pavement deflection is measured by the Benkelman Beam which consists of a slender beam 3.66 m long pivoted at a distance of 2.44 m from the tip .By suitably placing the probe between the dual wheels of a loaded truck, it is possible to measure the rebound and residual deflections of the pavement structure. While the rebound deflection is the one related to pavement performance, the residual deflection may be due to non- recoverable deflection of the pavement or because of the influence of the deflection bowl on the front legs of the beam. Rebound deflection is used for overlay design.

PROCEDURE FOR DEFLECTION SURVEY

The deflection survey essentially consists of two operations:

- condition survey for collecting the basic information of the road structure and based on this, the demarcation of the road into sections of more or less equal performance
- Actual deflection measurements.

Pavement Condition Survey: This phase of operation, which shall precede the actual deflection measurement, consists primarily of visual observations supplemented by simple measurements for rut-depth using a 3 meter straight edge. Based on these, the road length shall be classified into sections of equal performance in accordance witii the criteria given in Table 1

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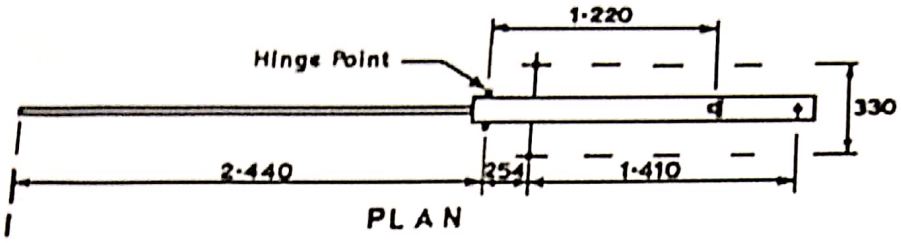
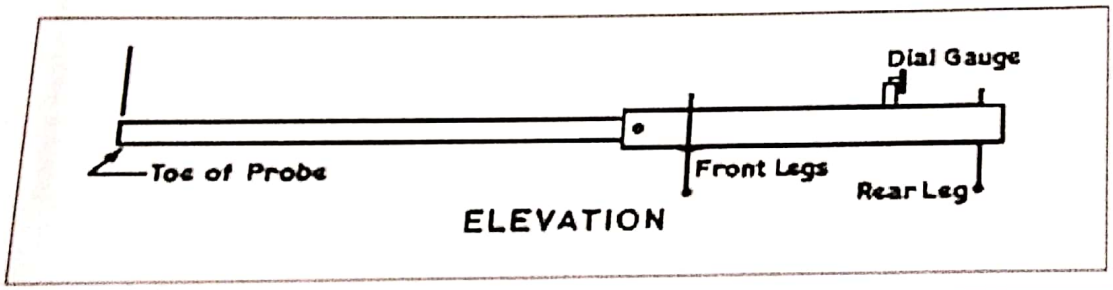
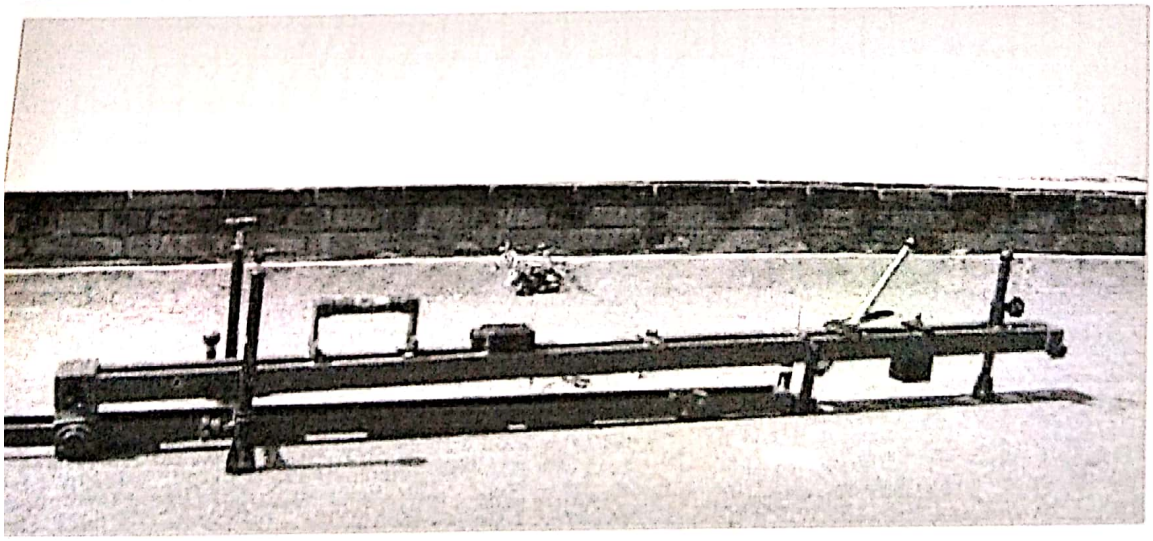
probe was placed. Otherwise, the dial gauge should be checked and replaced if necessary. If the dial gauge is functioning correctly, the beam pivot should be checked for free and smooth operation, secondly the striking plate beneath the dial gauge spindle should be checked to ensure that it is tightly secured and has not become grooved by the dial gauge stylus



- Select the points and mark
- The dual wheel of the truck is centered above the mark
- The probe of Benkelman beam is placed between dual tyres at the marked position
- Dial gauge is set at 1cm
- Initial reading(S) is recorded where rate of deflection is less than or equal to 0.025mm/min
- Truck is driven forward a further 9m
- Final reading (F)is recorded
- Pavement temperature is recorded once in each hour





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CALCULATION

Find (S-I) & (S-F)

(i) If Differential reading less than or equal to 0.025mm (2.5 Divisions) then true rebound deflection at temperature T is

$$XT=2(S-F)$$

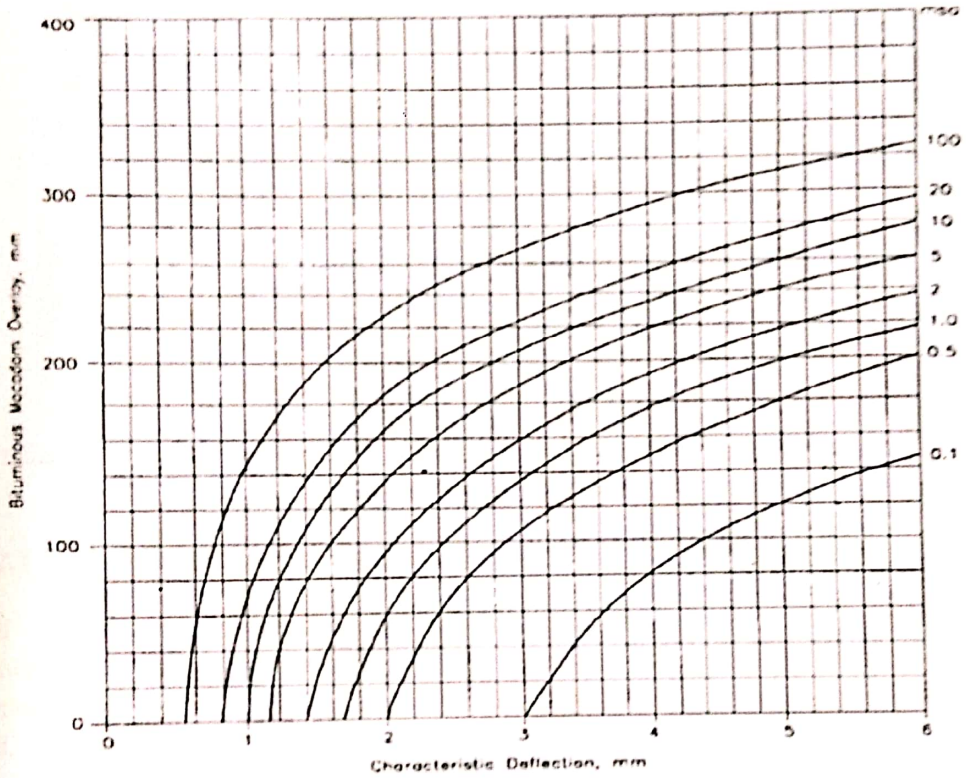
(ii) If Differential reading greater than or equal to 0.025mm(2.5 Divisions) then true rebound deflection at temperature T is

$$XT=2(S-F)+5.82(I-F)$$

For Major and minor roads

$D_c = M+S$

Where m=Ex/n



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